



June 24, 2012

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20054

Re: WT Docket 03-137/*Proposed Updates to Commission Testing Guidelines Regarding Human Exposure to Radiofrequency Electromagnetic Energy*

Dear Ms. Dortch:

The purpose of this letter is to address how consumer adoption of after-market form-fitting cases might bear upon the standards for evaluating human exposure to radio frequency (“RF”) radiation from wireless devices, as set forth in Office of Engineering and Technology (“OET”) Bulletin 65, as amended (“Bulletin 65”).¹ Based upon this review, Pong will recommend steps the Federal Communications Commission (the “Commission”) could take to modernize its standards for testing wireless devices, in order more accurately to reflect the “normal operating conditions” that consumers experience today. These recommendations will further the Commission’s coordinate objectives of ensuring both device safety and testing integrity. A copy of this letter is filed in the Commission’s WT Docket No. 03-137.

I. Introduction

As part of the Commission’s regulatory regime, the performance of devices is ensured through (among other things) an “equipment authorization process” overseen by the OET—the requirements of which appear in 47 C.F.R. Part 15.² Broadly speaking, these requirements encompass two components: (1) network service quality (in terms of a device’s performance on the wireless network) and (2) consumer health and safety in terms of a device’s Specific Absorption Rate (“SAR”)³ rating. Concerning the second of these factors, Bulletin 65 prescribes recommended practices for determining SAR in the human body due to wireless devices—the subject of the Commission’s WT Docket No. 03-137. All devices

¹ *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, edition 97-01, August 1997,

http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf. The Commission later issued supplements to Bulletin 65 that purposed, *inter alia*, “to provide parties filing applications for equipment authorization with guidance on complying with the latest requirements using up-to-date test procedures . . . [but was] not intended, however, to establish mandatory procedures [given that] other methods and procedures may be acceptable if based on sound engineering practice.” *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, Supplement C (Edition 01-01) to Bulletin 65 (“Supplement C”), June 2001, preamble.

http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65c.pdf.

² Cf. <http://transition.fcc.gov/oet/ea/ea/measurements.html> (summarizing various measurement procedures that may be used when testing equipment to determine its compliance with Commission rules).

³ *In re Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Release No. 96-326, 11 F.C.C.R. 15123, 15124 (1996). The Commission adopted the current RF radiation exposure standards that establish a maximum SAR of 1.6 watts per kilogram (1.6 W/kg) for spatial peak SAR as averaged over any 1 gram of tissue. See 47 C.F.R. §2.1093(d)(2). All wireless devices distributed or sold in the United States must comply with this limit.

must pass the testing that Bulletin 65 outlines, before they can be sold to consumers.

A. *Bulletin 65—Commission Intent*

Bulletin 65 intended to effect a testing regime that replicated consumers’ actual experiences and behaviors vis-à-vis wireless devices, and so expressly states:

For purposes of evaluating compliance with localized SAR guidelines, portable devices should be tested or evaluated ***based on normal operating positions or conditions***.⁴

The Commission went to great lengths to see that testing simulates “normal operating positions or conditions.” For example, Bulletin 65 specifies the positioning of a test apparatus in relation to a phantom human head and jaw, inasmuch as “small changes in the positioning of a test device may sometimes lead to unexpected changes in energy absorption in the tissue medium.”⁵ Bulletin 65 also provides for the use of “a non-metallic holder to position [the device] precisely against the head or body phantom”⁶ despite the fact that “when handsets are evaluated without a hand model, more energy is absorbed in the head phantom.”⁷ Bulletin 65 further considers temperature⁸; the presence of external DC power adapters⁹; and devices designed for body-worn configurations such as shoulder, waist, or chest-worn transmitters¹⁰, in simulating “normal” use.

Indeed in Bulletin 65, the Commission recognized that, to simulate *normal operating positions or conditions*, **testing should likewise account for the presence of device accessories**. Supplement C thus states:

*Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device.*¹¹

Concededly, the proliferation of cases largely post-dates the 1997 release of Bulletin 65 and its latest 2001 supplements.¹² The Commission nonetheless recognized that, *under normal operating positions or conditions*, testing should account for the presence of device accessories. While form-fitting cases as we know them did not exist in 2001—due, among other reasons, to the size and bulk of portable devices at the time, as compared to today’s increasingly small and thin smartphones—accessories like holsters and belt clips had become prevalent.

The Commission further expressly acknowledged that the presence of accessories (like holsters and belt

⁴ Bulletin 65, at page 42, emphasis added. “Portable devices”—as opposed to “mobile devices” generally—mean “transmitters whose radiating structures are designed to be used *within 20 centimeters of the body of the user*.” *Id.* at 15, emphasis added.

⁵ Supplement C, at page 10.

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*, at page 45.

⁹ *Id.*, at page 46.

¹⁰ *Id.*

¹¹ *Id.*, at 41, emphasis added.

¹² For context’s sake, Palm Inc. introduced the Kyocera 6035—the first “smartphone” deployed in widespread consumer use within the United States—in 2001; Research in Motion Limited released its first BlackBerry devices in 2002; and Apple Inc. unveiled the iPhone in 2007.

clips) will “*affect the SAR produced by the transmitting device.*”¹³ In order to protect consumers further, therefore, Bulletin 65 also stipulated cautionary statements in user manuals: specifically to the effect that ***certain accessories may cause the portable device to exceed the Commission’s RF compliance requirements.*** Bulletin 65 provided that “[i]n order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and caution statements should be included in the manual. The information should allow users to make informed decisions on the type of body-worn accessories and operating configurations that are appropriate for the device.”¹⁴ Bulletin 65 further provided specific examples of such statements, including a statement that use of certain accessories “*may not ensure compliance with FCC RF exposure guidelines.*”¹⁵

The Commission released Bulletin 65 in 1997, based on a proceeding initiated in 1996, and has not updated it since 2001.

B. Bulletin 65—Acknowledged Testing Anomalies

Notwithstanding the Commission’s intent to produce “real world” test results, Bulletin 65 itself either tacitly or expressly acknowledges many testing anomalies within its regime. Bulletin 65 identifies 23 different reasons why SAR results may vary among testing facilities: (1) axial isotropy error; (2) hemispherical isotropy error; (3) spatial resolution tolerance; (4) boundary-effects error; (5) linearity error; (6) sensitivity error; (7) response time error; (8) integration time error; (9) readout electronics error; (10) errors from RF ambient conditions; (11) probe positioner calibration error; (12) probe positioning error with respect to the phantom shell; (13) errors from extrapolation, interpolation, and integration algorithms; (14) test sample output power drift error; (15) SAR variation due to performance tolerance of the test sample; (16) SAR variation due to tolerance of production units; (17) test sample positioning error; (18) device holder or positioner tolerance; (19) phantom production tolerance; (20) target liquid conductivity tolerance; (21) measured liquid conductivity error; (22) target liquid permittivity tolerance; and (23) measured liquid permittivity error.¹⁶

Supplement C further concedes¹⁷: “Measurement uncertainties are calculated using the tolerances of the instrumentation used in the measurement, the measurement setup variability, and the technique used to perform the SAR evaluation. The overall uncertainty is calculated in part by identifying uncertainties in the instrumentation chain used in performing each of the procedures in the evaluation.” It is important to reiterate that OEMs self-certify their own results in the face of these same “measurement uncertainties.”

II. Omission of Express Reference to Wireless Device Cases in Bulletin 65 Requirements

Again, however—apart from these already acknowledged variables, and despite the Commission’s existing guidelines to test with accessories and provide corollary caution statements—Bulletin 65 omits any express recommendation to test how form-fitting cases can impact the SAR rating of wireless handsets. This omission is, as previously noted, understandable given that Bulletin 65 was released in 1997 and last updated in 2001, based on a record in a proceeding commenced in 1996—a timeframe that predates smartphones, tablets, and form-fitting cases. Given widespread consumer adoption of cases, however—by as many as 85% of smartphone and tablet users—the absence of cases in testing protocols today is not only material but also may eviscerate the Commission’s fundamental guideline that “***devices***

¹³ Supplement C, at page 41. Supplement C states: “Both the physical spacing to the body of the user as dictated by the accessory and the materials used in an accessory affect the SAR produced by the transmitting device.”

¹⁴ *Id.*, at page 41.

¹⁵ *Id.*

¹⁶ *Id.*, at pages 52-53.

¹⁷ *Id.*, at page 50.

should be tested or evaluated based on normal operating positions or conditions.”

A. Case Market Statistics, and Consumer Adoption of Wireless Devices

The market for protective cases is expected to grow at an annual rate of 19.2% per annum between 2012 and 2017, and currently exceeds \$4.5 billion globally.¹⁸ In North America alone, 179 million smartphones and 52 million media tablets will ship in 2012, with totals reaching 262 million smartphones and 73 million tablets by 2017. The protective case market in North America now totals nearly \$1.6 billion and will grow at an annual rate of 14.8% through 2017 when revenues will exceed \$3.1 billion.¹⁹ The so-called “attachment rate” (i.e., that rate at which consumers purchase) for cases is 0.5X at device point of sale²⁰ and—based upon anecdotal information provided to Pong and published industry research—may exceed a rate of **at least 1.5 per device** over time.

Consumer adoption and use of wireless devices has changed dramatically since the publication of Bulletin 65 in 1997 and Supplement C in 2001. Fifteen years ago, the majority of Americans did not have cell phones. But reliance upon wireless devices has since skyrocketed. In 1996, wireless penetration in the United States was just 16%; in 2001 it was 44.2%; and by 2011 it was 104.6%.²¹ Annualized minutes of use in 1996 totaled 51.97 billion; in 2001 it was 456.96 billion; and in 2011 it was 22.96 trillion.²² Annualized wireless data revenues increased from \$0 in 1996 to \$62.7 billion in 2011.²³ Americans today rely on their devices, using and carrying them in their clothing and against their heads and bodies, for longer periods than ever before—indeed even sleeping with them²⁴--such that “body worn configuration” has become not the exception but the norm. It is important to recall in this context that—while “body worn configuration” (and body SAR testing) under Bulletin 65 contemplates the placement of a cell phone at least 15 mm away from the user—modern habits tend towards much closer proximities, as well as longer exposures.²⁵

B. Effects of Cases on Portable Devices

Because after-market form-fitting cases contour to devices themselves, these products—that are neither tested nor assumed in the handset equipment authorization process—have become as integral to devices as OEM phone and tablet shells. As such, a case can detrimentally impact not only consumers’ experiences of wireless network service quality but also their absorption of radiation. ***The resultant “radiation profile” of a given device with a case may bear little resemblance to that of the same device without a case, as tested in the equipment authorization process.*** This altered profile, as well, might dramatically increase SAR²⁶ or dramatically reduce radiated power. The Commission

¹⁸ Source: ABI Research.

¹⁹ *Id.*

²⁰ *Id.*

²¹ Source: CTIA. See <http://www.ctia.org/advocacy/research/index.cfm/AID/10323>.

²² *Id.*

²³ *Id.*

²⁴ See <http://www.digitalbuzzblog.com/infographic-how-adults-are-using-mobile-phones> and <http://www.time.com/time/health/article/0,8599,1658166,00.html>.

²⁵ See Supplement C, at page 41. Supplement C contemplates that, if a belt clip or holster accompanies a portable device, it should be tested in the accessory next to the test phantom. “Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm.”

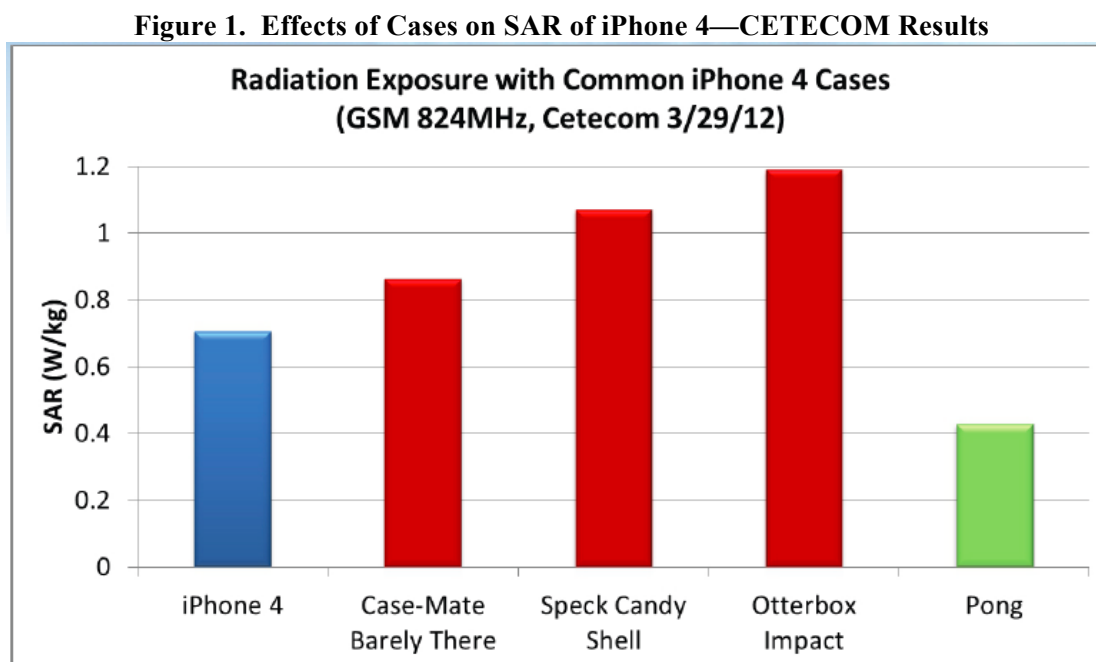
²⁶ The increased SAR profile in actual use, moreover, might even exceed the “theoretical” assumptions that inform the Commission’s safety standard of 1.6 W/kg. As Supplement C acknowledges, “Device performance may shift because of dielectric loading.” Supplement C, at page 13. The efficiency of an antenna depends on the dielectric

recognized this unassailable fact at least as early as 2001, as noted above.²⁷

For illustrative purposes only, the following charts and graphs show the impact the Pong case has on SAR and TRP versus other leading brands and even “bare” devices. Pong is pleased to share any raw test data with the Commission.

C. Test Data

Figure 1 shows the impacts of various cell phone cases on the SAR of an iPhone 4 versus a Pong case on a sample GSM 824 MHz band tested at CETECOM²⁸ on March 29, 2012.



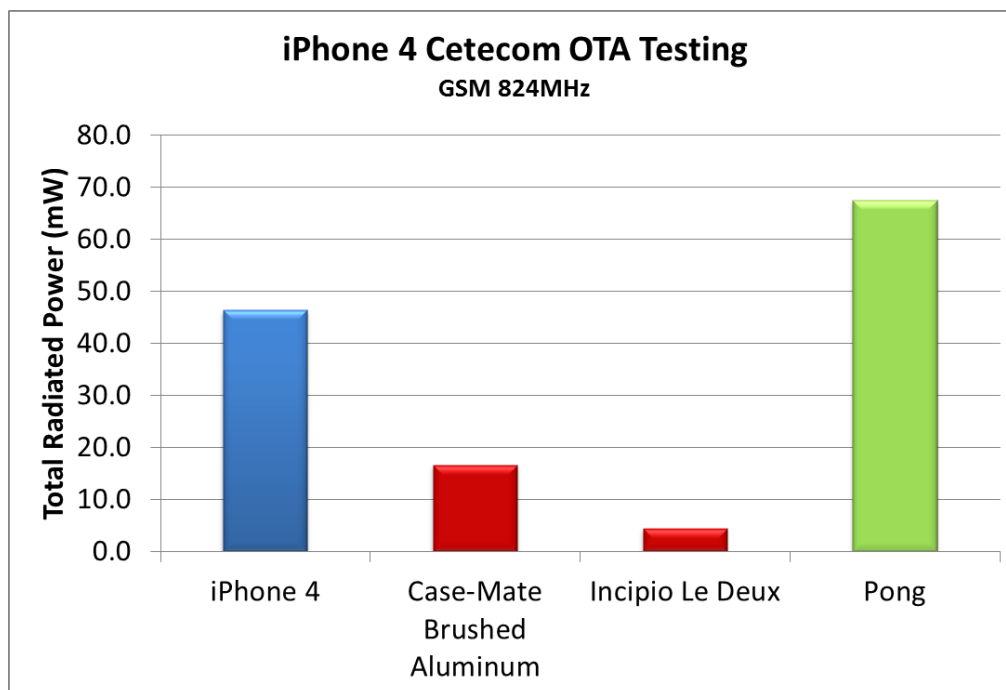
character of its surrounding medium. Cellular antennas are typically designed to operate surrounded mostly by air. Changing the material surrounding the antenna—for example, with a case—can alter the impedance match and affect the antenna’s efficiency. In some scenarios (dependent on frequency and dielectric properties) efficiency can be improved, so that the antenna radiates more power. The addition of a case to a device, therefore, could change antenna efficiency and increase radiated power, so that the safety limit is violated. In any event, the stated SAR rating of a device for purposes of its equipment authorization would differ from its actual SAR emission with the addition of a form-fitting case. The fact that consumers generally use their devices against their heads and bodies—again, contrary to the assumptions that underlie both the Commission’s safety standard and equipment authorization testing regulations—would exacerbate this state of affairs.

²⁷ See Section I.A (penultimate paragraph).

²⁸ The Commission recognizes CETECOM as a Telecommunications Certification Body or “TCB.” See www.cetecom.com. Pong tests its cases in third-party facilities (including CETECOM) certified by the Commission, and calibrates its own extensive equipment to these industry standards.

Figure 2 compares the Total Radiated Power (“TRP”) of an iPhone 4 measured in an OTA (Over The Air) test in an anechoic chamber at CETECOM.

Figure 2. Effects of Cases on TRP of iPhone 4—CETECOM Results. Test configuration was left side of a SAM head, held with a SAM left hand.



As indicated by the testing results shown above, cases can materially impact SAR and TRP.

Conclusion

The Commission’s testing guidelines are designed to protect the safety and welfare of consumers. In order to ensure the soundness of the testing regime, Bulletin 65 recognized the need to conduct testing based on how consumers actually use devices. Both wireless products themselves, and consumer conduct relative to them, have changed dramatically since OET published Bulletin 65. These changes include the advent and proliferation of smartphones, tablets, and wireless device cases. A substantial majority of wireless device users today employ cases that, unquestionably, dramatically impact SAR.²⁹ To safeguard the continued integrity of the testing program that underlies the equipment authorization process, and properly to promote consumers’ safety and welfare, the Commission should—consistent with the purposes of Bulletin 65—update its testing guidelines more accurately to reflect predominant consumer behavior. This update should incorporate testing guidelines that include the presence of a case, which would more accurately determine (among other things) the absorption of radiation by wireless device users.

Furthermore, in order to allow consumers to make informed decisions—and consistent with Bulletin 65—the Commission should establish appropriate guidelines for the inclusion of cautionary statements in the

²⁹ Pong’s letter dated May 31, 2012 to the Commission (filed in the Commission’s WT Docket No. 11-186) discusses consequent impacts from form-fitting cases on wireless device reception, battery life, and overall network efficiency—as well as on SAR.

manuals for each portable device, informing consumers that use of certain cases “may not ensure compliance with FCC RF exposure guidelines”—the very warning that the Commission now recommends for belt-clips, holsters, and other body-worn accessories.

Thank you for your consideration of these matters.

Sincerely,

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